Addressing the Childhood Asthma Crisis in Harlem: The Harlem Children's Zone Asthma Initiative

Stephen W. Nicholas, MD, Betina Jean-Louis, PhD, Benjamin Ortiz, MD, Mary Northridge, PhD, MPH, Katherine Shoemaker, MPP, Roger Vaughan, DrPH, MS, Michaela Rome, PhD, Geoffrey Canada, MEd, and Vincent Hutchinson, MD, for the Harlem Children's Zone Asthma Initiative

Objectives. We determined the prevalence of asthma and estimated baseline asthma symptoms and asthma management strategies among children aged 0–12 years in Central Harlem.

Methods. The Harlem Children's Zone Asthma Initiative is a longitudinal, community-based intervention designed for poor children with asthma. Children aged 0–12 years who live or go to school in the Harlem Children's Zone Project or who participate in any Harlem Children's Zone, Inc, program were screened for asthma. Children with asthma or asthma-like symptoms were invited to participate in an intensive intervention.

Results. Of the 1982 children currently screened, 28.5% have been told by a doctor or nurse that they have asthma, and 30.3% have asthma or asthma-like symptoms. To date, 229 children are enrolled in the Harlem Children's Zone Asthma Initiative; at baseline, 24.0% had missed school in the last 14 days because of asthma.

Conclusion. The high prevalence of asthma among children in the Harlem Children's Zone Project is consistent with reports from other poor urban communities. Intensive efforts are under way to reduce children's asthma symptoms and improve their asthma management strategies. (*Am J Public Health.* 2005;95: 245–249. doi: 10.2105/AJPH.2004.042705)

The current prevalence of doctor-diagnosed childhood asthma in the United States is estimated as 7%,[1,2] with African American children having a slightly higher national prevalence of 8%.[2] However, in New York City 17% of children have experienced asthma-like symptoms at some point in their lives.[3] Children living in poor neighborhoods bear the highest burden of disease and are 4 times more likely to be hospitalized for asthma as children who live in wealthy neighborhoods.[4] In Central Harlem, a community with a devastating overall child health profile,[5] pediatric asthma hospitalizations increased 62% from 1988 to 1997. In 2002 Central Harlem had the third highest rate of pediatric asthma hospitalizations among New York City's 42 neighborhoods.[3] Asthma remains the leading cause for emergency room evaluations and pediatric hospitalizations at Harlem Hospital Center, the primary source of health care in Central Harlem.[6] Although the determinants of asthma remain speculative, effective management through appropriate interventions is achievable.[7]

The Harlem Children's Zone Project is a community-building strategy of Harlem Children's Zone, Inc,[8] that is intended to improve the health and well-being of the approximately 13 000 residents living within a 24-block area of Central Harlem.[9] The geographic boundaries of the Harlem Children's Zone Project run north to south from 123rd Street to 116th Street, and east to west from 5th Avenue to 8th Avenue, although expansion of the zone to 60 blocks is currently underway. Concern over elevated school absenteeism resulting from asthma and over the limitations of existing hospital-based interventions led to a partnership between Harlem Children's Zone, Inc, and the Department of Pediatrics at Harlem Hospital Center, forming the Harlem Children's Zone Asthma Initiative.[10] What distinguishes this effort from previous community-based health interventions in Harlem is that it was incorporated into an existing community-building initiative designed to improve children's education (e.g., through Harlem Peacemakers[8]), provide families with safe and affordable housing (as per the activities of Community Pride[8]), and improve residents' parenting skills (through ongoing classes at Baby College[8]); thus, connections to needed technical, public, and legal services were facilitated, as detailed in the Methods section of this article.

To be successful in reaching and screening all children aged 0–12 years in the community who might benefit from the services being offered, we devised an integrated strategy that built on the existing infrastructure at the involved organizations (Figure 1). In addition, we partnered with local institutions and agencies for expert advice and needed services, notably the Mailman School of Public Health and the Urban Planning Program at Columbia University, the New York City Department of Health and Mental Hygiene; the New York City Board of Education; the Brazelton Touchpoints Center, a child and family development training program; the law firm LaBoeuf, Lamb, Greene & MacRae; and Volunteers of Legal Services. Finally, we modeled our integrated approach after the Seattle–King County Health Homes Project[11] and likewise followed an iterative approach of developing initial protocols on the basis of existing scientific evidence and revising protocols as involved team members gained additional experience during the implementation of the intervention components.

Notwithstanding previous evidence that asthma disproportionately affects children who are poor, of color, and live in certain geographic areas,[1–7,11–18] we were unprepared for the burden of asthma suffered by children in the Harlem Children's Zone Project, which necessitated scaling up our initial estimates of personnel and services needed for this intervention. Indeed, our screening initiative yielded twice the prevalence of asthma initially expected, which re-

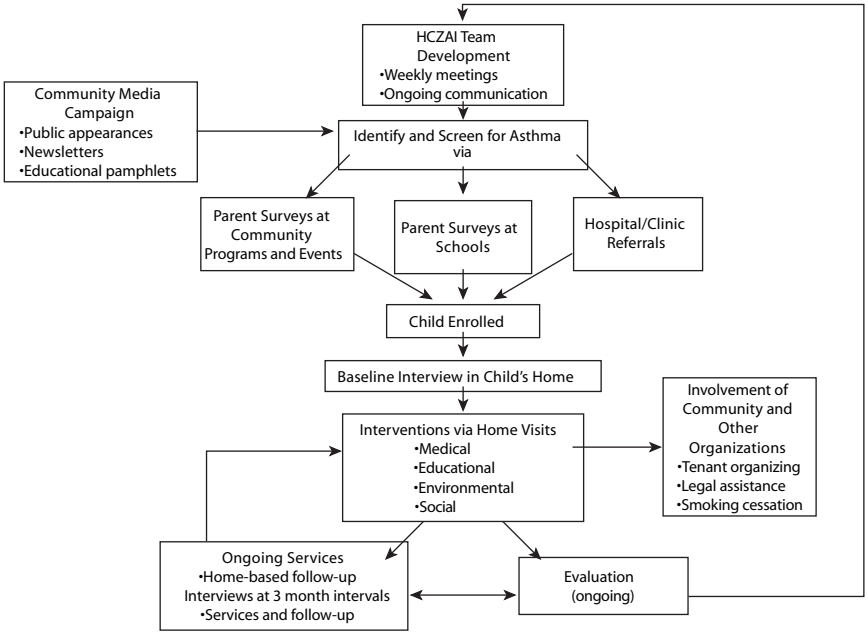

FIGURE 1—The Harlem Children's Zone Asthma Initiative integrates new services and community-based collaborations with existing organizational infrastructures.

quired seeking additional resources in terms of personnel and supplies. Additional funding was secured, and further augmentation of funds is being sought to expand our initiative to address the childhood asthma crisis in Harlem more effectively over the next several years. We report the screening results and preliminary estimates of asthma symptoms and management strategies for enrolled children.

METHODS

Asthma Screening and Program Enrollment

A screening questionnaire was distributed to the parents/guardians of children aged 0–12 years primarily through Harlem Children's Zone, Inc, programs, including Baby College (a child development workshop series for parents), Harlem Gems (a prekindergarten program), and Harlem Peacemakers (college-aged interns working in elementary school classrooms).[7] Other strategies for reaching and screening the approximately 2200 children aged 0–12 years in the Harlem Children's Zone Project[8] included active surveillance of Harlem Hospital Center inpatient, emergency room, and clinic records, as well as block-by-block canvassing for recreational programs and day care centers.

Parents/guardians were offered the opportunity to have their child examined by a doctor or nurse from the Harlem Hospital pediatric asthma team. Families of children with either self-reported asthma or asthma-like symptoms or physical findings consistent with asthma were invited to participate in the Harlem Children's Zone Asthma Initiative. A community health worker from the asthma team then visited the homes of the enrolled children and completed a baseline assessment.

A series of medical, educational, environmental, social, and legal interventions is being delivered to program participants on the basis of their needs. Because of limited resources in the start-up period, we targeted children with more severe asthma as priorities on which the team should focus first. Medical interventions include providing spacer devices to enrolled children and training them to use them properly to achieve optimal intrapulmonary delivery of inhaled "pump" medications and ensuring that each child in the program has an individualized asthma action plan. Educational interventions include reinforcing with parents and children "asthma basics 101," as well as informing them about effective ways to eliminate or reduce common triggers of asthma, including environmental tobacco smoke and animal dander. Environmental interventions include providing program participants with dust covers for bed mattresses and pest remediation services for heavily infested homes. Social interventions include a host of services available through Harlem Children's Zone, Inc., including Truancy Prevention, SMART (Shaping Minds Around Reading and Technology), and the Family Support Center, augmented by referrals to New York City agencies when useful and apt. Family support groups are provided through the Brazelton Touchpoints Center. Legal interventions are provided free to program participants by Laboeuf, Lamb, Greene & MacRae via Volunteers of Legal Services, whose lawyers assist the asthma team social worker in resolving problems referred to them dealing with immigration, domestic violence, and housing conditions.

Instruments

The screening asthma survey consisted of 22 items used exactly or modified slightly from standardized questions, including asthma diagnosis and symptoms from the National Health Interview Survey,[12,16] the National Health and Examination Survey III,[2] and the National Cooperative Inner-City Asthma Study[19]; race/ethnicity from the US Census 2000[20,21]; and environmental tobacco smoke from the 2001 Florida Youth Tobacco Survey.[22] The medical information sheet was completed by a physician or nurse from the Harlem Hospital Center pediatric asthma team and included the results of stethoscopic chest examinations, peak flow expiratory flow rates for children aged 6 years and older, and heights and weights. Items from the baseline interview used in this article are 13 selected indicators of asthma symptoms and management strategies adapted from the National Cooperative Inner-City Asthma Study.[19]

Database Management and Data Analysis

A database management system was designed to organize and track the various intervention components and measures. A geo-

graphic information system was simultaneously developed to allow for mapping of results and spatial analysis. Prevalence estimates for item responses were calculated using SAS software.[23] Chi-square tests were conducted to look for differences between groups defined by the following characteristics: age group, gender, race/ethnicity, regular source of health care, health insurance, and household environmental tobacco smoke exposure.[24]

RESULTS

To date, 1982 children have been screened as part of the Harlem Children's Zone Asthma Initiative, although a small proportion of these children do not live or go to school within the boundaries of the Harlem Children's Zone Project or participate in any Harlem Children's Zone, Inc, program. Whenever possible, educational materials or services are provided to children who screen positive for asthma and who are not strictly eligible for program participation. According to the US Census 2000, an estimated 2200 children aged 0–12 years currently live in the Harlem Children's Zone Project,[9] although there is constant movement of residents as a result of economic, social, and family needs. Continued efforts are under way to reach and screen the remaining children in the target area.

Participation rates for the screening survey at the various sites ranged from 62% to 100%, with 88% of respondents consenting to a physical examination of their children. The highest participation rates were obtained at Baby College and elementary school classrooms with Harlem Peacemaker interns (all > 90%).

Of the 1982 children screened to date, 28.5% have been told by a doctor or nurse that they have asthma, and 30.3% are currently experiencing asthma or asthma symptoms (Table 1). Higher prevalence rates were found for school-aged children, boys, Latinos, and children living with smokers. It proved difficult to examine Black and Latino subgroups by place of birth as a result of small numbers of screened children who were born outside of the United States. Children born in the Dominican Republic (27), West Africa (15), and the West Indies (12) were part of our sample, as were 13 US citizens born in Puerto Rico. Although asthma diagnosis in children aged 3 years and younger is problematic, improvement of asthma symptoms after treatment with a bronchodilator or other interventional therapy is commonly accepted by clinicians as evidence of the diagnosis. Children with a regular source of health care and health insurance were more likely to have been diagnosed with asthma, in part because their symptoms prompted care seeking, diagnosis, and coverage.

Baseline interviews with parents/guardians have been completed for 229 children enrolled in the initiative over a period of 18 months (Table 2). In the 14 days preceding assessment, 57.6% of children experienced wheezing or other asthma symptoms, and 24.0% missed school because of an exacerbation of asthma symptoms. In the last 3 months, 34.9% of children visited the emergency room, and 8.3% were hospitalized for treatment of asthma symptoms. Less than half of children at enrollment used appropriate asthma management strategies, such as having a spacer device (42.8%), a peak flow meter (21.0%), or an asthma action plan (18.8%).

TABLE 1—Percentage of Screened Children With Asthma or Asthma Symptoms, by Selected Demographic and Health Care Characteristics: Harlem Children's Zone Project, Central Harlem, New York City, 2001–2003 (n = 1982)

	Number in Group[a]	% With Asthma in Group[b]	% With Asthma or Asthma Symptoms in Group[b,c]	*P*[d]
Age group, y				.001
0–4	707	26.6	28.1	
5–9	991	27.8	29.9	
10–15	230	40.9	42.6	
Gender				.05
Female	926	27.0	28.7	
Male	905	32.1	34.0	
Race/ethnicity				.05
Black/non-Latino	1143	28.0	30.0	
Black/Latino	98	39.8	40.8	
White/Latino	32	43.7	43.7	
Other	94	33.3	35.5	
Child has a regular source of health care				.01
Yes	1661	29.9	31.7	
No	96	17.7	17.7	
Child has health insurance				.05
Yes	1649	30.7	32.5	
No	137	22.6	24.8	
Household member smokes cigarettes				.001
Yes	433	37.9	38.4	
No	1347	27.9	29.5	
Overall	1982	28.5	30.3	

[a]Numbers may vary because of missing values.
[b]Children with asthma = parent/guardian indicated on the screening survey that the child had ever been told by a doctor or nurse that the child has asthma.
[c]Children with asthma symptoms = health care provider indicated on the medical information sheet that the chest exam was not clear or that the Peak Expiratory Flow Rate for children aged 6 years and older was correctly performed and abnormal.
[d]Chi-square comparing groups for each characteristic (in every case, the *P* values obtained were the same on rounding for comparisons of groups by percentage with asthma and by percentage with asthma or asthma symptoms).

DISCUSSION

The prevalence of childhood asthma reported here (28.5%) is 4 times the national

TABLE 2—Asthma Symptoms and Management Strategies at Baseline Among Children Enrolled in the Harlem Children's Zone Asthma Initiative: Harlem Children's Zone Project, Central Harlem, New York City, 2002–2003 (n = 229)

	% Reporting "Yes" for Selected Asthma Symptoms and Management Strategies
Asthma symptoms reported in the last 14 days	
Child experienced wheezing or tightness in the chest or had a cough	57.6
Child had to slow down or stop play or activities because of asthma, wheezing, cough, or tightness in the chest	44.5
Child woke up because of asthma, wheezing, cough, or tightness in the chest	43.7
Child missed school for any reason	33.2
Child missed school because of asthma complications	24.0
Asthma symptoms reported in the last 3 months	
Child visited the emergency room or made an unscheduled visit for treatment of asthma	34.9
Child was admitted to a hospital and stayed overnight because of asthma symptoms	8.3
Child took any medications for asthma	77.3
Reported use of asthma management strategies	
Child took any medications prescribed for asthma every day in the last 3 months, even when feeling well, to prevent asthma symptoms	28.8
Child has a spacer device such as Aerochamber, Optichamber, or Inspirease	42.8
Child uses a spacer device with any of the inhaled ("pump") medications	36.2
Child has a peak flow meter	21.0
Child has an asthma action plan	18.8

Note. Numbers may vary owing to missing values.

estimate of 7%[1,2] and more than 3 times the national estimate for African American children of 8%.[2] Although the precise questions asked and methods of delivery vary somewhat between our survey and the other surveys cited here, these differences are nonetheless useful for comparative purposes. Although the 28.5% childhood asthma prevalence we obtained on screening is double what we initially expected to find in Central Harlem, it is nonetheless consistent with other unpublished and published reports showing a disproportionate burden in poor urban neighborhoods, especially among Latinos.[3,4,7,13,14,17,18] Another 2% of children had pulmonary findings indicative of asthma on physical examination, for an overall prevalence of asthma or asthma-like symptoms of 30.3%. The significantly higher childhood asthma prevalence in households in which members smoke cigarettes (38.4% vs 29.5% in households without smokers) led us to incorporate smoking cessation services into the initiative. Although we targeted only children aged 0–12 years for this initiative, we elected not to turn any child away from participation in our community screenings. Thus, some slightly older children were screened who may have been more likely than other community children of the same age to be the siblings of children with asthma or to be experiencing asthma symptoms themselves, which may account for the higher prevalence of asthma found in the oldest age group (10–15 years).

Childhood asthma in Central Harlem is not only highly prevalent, but also severe. Half of the children with asthma enrolled in the Harlem Children's Zone Asthma Initiative to date have mild, moderate, or severe persistent asthma,[25] as indicated by recent wheezing, curtailment of play activities, and nighttime symptoms. These data were collected over an 18-month period; testing for seasonal variation is planned once sufficient follow-up data are collected to allow for meaningful statistical evaluation. Asthma-related school absences, emergency room care, and hospitalizations are frequent in our preliminary program data. Nonetheless, asthma management strategies for most children are inadequate, stressing the need for ongoing child and family education. Many children appear to be undermedicated according to the program physicians (B. Ortiz and V. Hutchinson, oral communications), which indicates a continuing need to educate health providers about asthma treatment.

Children and their families enrolled in this asthma initiative are receiving an array of medical, educational, environmental, social, and legal services across a spectrum of home, school, community, and health care settings. Additional years of implementation and follow-up will help determine whether these interventions are effective in reducing symptoms, school absenteeism, emergency room visits, and hospitalizations resulting from an exacerbation of asthma symptoms.

A dialogue must start now with policymakers to determine how to pay for community-based asthma services, which are currently not reimbursable under Medicaid. Five Central Harlem schools, working in tandem with health educators and medical providers who provide state-of-the-art asthma care, are being used as centers to deliver community-based asthma services, but our greatest challenge is to educate and support children and families to implement and sustain the effective symptom prevention and treatment services that are currently available. More translational research is needed, but action cannot wait. The magnitude of the childhood asthma crisis in Central Harlem demands an immediate response. ■

About the Authors

Stephen W. Nicholas, Benjamin Ortiz, and Vincent Hutchinson are with the Department of Pediatrics, Harlem Hospital Center/Columbia University, New York, NY; Betina Jean-Louis, Michaela Rome, Katherine Shoemaker, and Geoffrey Canada are with the Harlem Children's Zone, Inc., New York; Mary Northridge and Roger Vaughan are with the Harlem Health Promotion Center, Columbia University Mailman School of Public Health, New York.

Requests for reprints should be sent to Stephen W. Nicholas, MD, Department of Pediatrics, Harlem Hospital Center/Columbia University, 506 Lenox Avenue, MLK 17-105, New York, NY 10037 (e-mail: swn2@columbia.edu).

Contributors

S. W. Nicholas originated the program concept and design, analyzed and interpreted the data, drafted the article, and supervised the program. B. Ortiz revised the article and supervised the program. M. Northridge analyzed and interpreted the data, drafted the article, and supervised the program. K. Shoemaker analyzed and interpreted the data, drafted the article, and supervised the program. V. Hutchinson revised the article and supervised the program. G. Canada revised the article and supervised the program. B. Jean-Louis analyzed and interpreted the data, drafted the article, and supervised the program. R. Vaughn analyzed and interpreted the data, drafted the article, and provided the statistical expertise for this project. M. Rome analyzed and interpreted the data, drafted the article, and supervised the program.

Acknowledgments

Financial and ongoing program support for the Harlem Children's Zone Asthma Initiative is provided by the Robin Hood Foundation (grant RHF CU516688), the Anne E. Dyson Community Pediatrics Training Initiative, the National Institute of Environmental Health Sciences (grant 1R25 ES012574-01), the American Legacy Foundation (grant 5052), and the Centers for Disease Control and Prevention through the Harlem Health Promotion Center (grant U48/CCU209663-08).

We are grateful to Robert Mellins for reviewing this article and to Judy Palfrey of the Anne E. Dyson Community Pediatrics Training Initiative for her supportive role. Participants in the Harlem Children's Zone Asthma Initiative include the named authors on this article, as well as (in alphabetical order) T. Berry Brazelton, Jason Corburn, Jazmine Credell, Linda Cushman, Lisa Desrouchers, Daouda Diarrassouba, Shannon Farley, Lee Farrow, Keith Faulkner, Jacqueline Fox-Pascal, Cynthia Golembeski, Katrina Gonzalez, Marilyn Joseph, Daniel Kass, Renuka Kher, Sandra Klihr-Beal, Lucille Lebovitz, Rasuli Lewis, Cara McAteer, Brian McClendon, Robert Mellins, Dennis Mitchell, Carolyn Nash, Yvonne Pradier, Doris Prester, Miriam Ramos, David Saltzman, Gwendolyn Scott, Carron Sherry, Donna Shelley, Caressa Singleton, Joshua Sparrow, Seth Spielman, Denise Sutton, Gabriel Stover, Dawn Sykes, Michael Weinstein, Mizetta Wilson, and Candace Young.

Human Participant Protection

This study was approved by the Columbia University institutional review board at Harlem Hospital Center.

References

1. Centers for Disease Control and Prevention. Surveillance for Asthma—United States, 1980–1999. *Morb Mortal Wkly Rep.* 2002;51(SS-1):1–6.

2. Rodriguez MA, Winkleby MA, Ahn D, Sundquist J, Kraemer HC. Identification of population subgroups of children and adolescents with high asthma prevalence: findings from the Third National Health and Nutrition Examination Survey. *Arch Pediatr Adolesc Med.* 2002; 156:269–275.

3. New York City Department of Health and Mental Hygiene. NYC Vital Signs: Asthma can be controlled. Available at: http://home.nyc.gov/html/doh/pdf/survey/survey-2003asthma.pdf. Accessed November 30, 2003.

4. New York City Department of Health and Mental Hygiene. Asthma facts, 2nd ed. Available at: http://www.ci.nyc.ny.us/html/doh/pdf/asthma/facts.pdf. Accessed November 30, 2003.

5. Citizens' Committee for Children of New York. Keeping track of New York City's children. New York, NY: Citizen's Committee for Children; 2002.

6. United Hospital Fund. The State of New York City's Municipal Hospital System: report of the City Hospital Visiting Committee. New York, NY: United Hospital Fund; 2001.

7. Evans R 3rd, Gergen PJ, Mitchell H, et al. A randomized clinical trial to reduce asthma morbidity among inner-city children: results of the National Cooperative Inner-City Asthma Study. *J Pediatr.* 1999;36: 129–138.

8. Harlem Children's Zone, Inc. Harlem Children's Zone Project. Available at: http://www.hcz.org/hczproject/index.html. Accessed November 30, 2003.

9. United States Census Bureau. New York: 2000. Summary population and housing characteristics. Available at: http://www.census.gov/prod/cen2000/phc-1-34.pdf. Accessed November 30, 2003.

10. Northridge ME, Jean-Louis B, Shoemaker K, Nicholas S. Advancing population health in the Harlem Children's Zone Project. *Soz Praventivmed.* 2002;47: 201–204.

11. Krieger J, Takaro TK, Allen C, et al. The Seattle-King County Healthy Homes Project: implementation of a comprehensive approach to improving indoor environmental quality for low-income children with asthma. *Environ Health Perspect.* 2002;110(S2): 311–322.

12. Akinbami LJ, Schoendorf KC, Parker J. US childhood asthma prevalence estimates: the impact of the 1997 National Health Interview Survey redesign. *Am J Epidemiol.* 2003;158:99–104.

13. Cloutier MM, Wakefeld DB, Hall CB, Bailat HL. Childhood asthma in an urban community: prevalence, care system, and treatment. *Chest.* 2002;122: 1571–1579.

14. Crain EF, Weiss KB, Bijur PE, Hersh M, Westbrook L, Stein RE. An estimate of the prevalence of asthma and wheezing among inner-city children. *Pediatrics.* 1994;94:356–362.

15. Nelson DA, Johnson CC, Divine GW, Strauchman C, Joseph CL, Ownby DR. Ethnic differences in the prevalence of asthma in middle class children. *Ann Allergy Asthma Immunol.* 1997;78:21–26.

16. Newacheck PW, Halfon N. Prevalence, impact, and trends in childhood disability due to asthma. *Arch Pediatr Adolesc Med.* 2000;154:287–293.

17. Carr W, Zeitel L, Weiss K. Variations in asthma hospitalizations and deaths in New York City. *Am J Public Health.* 1992;82:59–65.

18. Claudio L, Tulton T, Doucette J, Landrigan PJ. Socioeconomic factors and asthma hospitalization rates in New York City. *J Asthma.* 1999;36:343–350.

19. Mitchell H, Senturia Y, Gergen P, et al. Design and methods of the National Cooperative Inner-City Asthma Study. *Pediatr Pulmonol.* 1997;24:237–252.

20. Grieco EM, Cassidy RD. Overview of race and Hispanic origin: Census 2000 brief. Available at: http://www.census.gov/prod/2001pubs/c2kbr01-1.pdf. Accessed October 12, 2003.

21. Northridge ME. Accounting for diversity and holding governments accountable: incorporating ethnicity into local health surveys and public health surveillance systems. *Soz Praventivmed.* 2002;48:211–213.

22. 2001 Florida Youth Tobacco Survey. Available at: http://tobacco.rti.org/data/New/type.cfm?SurveyType=Cross-sectional. Accessed October 12, 2003.

23. SAS Version 8. Cary, NC: SAS Institute, Inc.; 2001.

24. Fleiss JL, Levin B, Paik MC. Statistical Methods for Rates and Proportions, 3rd ed. New York, NY: Wiley, 2003.

25. National Institutes of Health. *National Asthma Education and Prevention Program: Clinical Practice Guidelines. Expert Panel Report 2. Guidelines for the Diagnosis and Management of Asthma.* Bethesda, Md: National Institute of Health. National Heart, Lung, and Blood Institute, 1997. NIH publication No. 97-4051.